

REMARKS

Claims 1, 4, 6-19, 23-29, 32 and 34-41 are all of the pending claims, with claims 1 and 29 being written in independent form. By virtue of this Amendment, Applicants cancel claims 5 and 33 without prejudice or disclaimer.

I. Allowable Subject Matter:

The Examiner indicates that claims 10, 11, 24-26, 38 and 39 would be allowable if rewritten in independent form. Applicants do not, however, rewrite the claims as suggested by the Examiner because independent claims 1 and 29 are believed to be patentable for the reasons discussed in detail below.

II. Claim Rejections on Prior Art Grounds:

The Examiner rejects claims 1, 4, 12-19, 27-29, 32, 40 and 41 under 35 U.S.C. §103(a) as being obvious over U.S. Patent No. 5,965,959 to Gamble et al. (“Gamble”) in view of U.S. Patent No. 4,688,132 to Dustmann (“Dustmann”) and U.S. Patent No. 4,709,314 to van de Klundert et al. (“van de Klundert”); and claims 5-9, 23 and 33-37 under 35 U.S.C. §103(a) as being obvious over Gamble in view of Dustmann and van de Klundert, and further in view of U.S. Patent No. 5,990,459 to Feustel et al. (“Feustel”). Applicants respectfully traverse all of these rejections in view of the following remarks.

A. Independent Claim 1:

Independent claim 1 recites (among other things) the following two features: (1) that the flux pump and the superconducting coil of the electromagnet “*are arranged together in a common vacuum chamber of a cryostat;*” and (2) that each of the two controllable switches in the secondary-side rectifier circuit includes “*a plurality of MOSFETs electrically connected in parallel to one another.*” Example, non-limiting embodiments of these features will be appreciated with references to Figs. 3 and 4. As shown in Fig. 3, the flux pump (inclusive of the primary coil 113 and the secondary coils 213 and 313 of the transformer and the switches 15 and 16) as well as the superconducting coil 11 of the electromagnetic 111 are arranged together in a common vacuum chamber of the cryostat 100. Turning to Fig. 4, each of the switches 15 and 16 may include a plurality of MOSFETs 15₁-15_n and 16₁-16_n, respectively. As shown, the MOSFETs of the switch 15 are electrically connected together in parallel, and the MOSFETs of the switch 16 are connected together in parallel. Express written description support for these features can be found throughout the instant specification. At least these features (as recited in independent claim 1), in combination with the other features recited in independent claim 1, are not taught or suggested by the prior art relied upon by the Examiner.

The Examiner relies upon the primary reference to Gamble to teach most of the features recited in claim 1, inclusive of the flux pump and the superconducting coil of the electromagnetic being arranged together in a common vacuum chamber of a cryostat. The Examiner recognizes that Gamble et al. (as well as the secondary reference to Dustmann) do not teach or suggest that the switches are coupled in parallel, and therefore looks to the secondary reference of van de Klundert to allegedly teach this feature. The Examiner’s rejection position is not convincing for the following reasons.

The Common Vacuum Chamber

The Examiner reliance upon the primary reference to Gamble is misplaced. Specifically, and with reference to Fig. 2 of Gamble, the flux pump includes a first coil 40 and a second coil 42. As clearly shown, the first coil 40 is disposed *outside* the cryogenic chamber 30, whereas the second coil 42 is disposed within the chamber.¹ Gamble goes on to expressly indicate that the external coil 40 and the internal coil 42 cooperate together to “*transfer power across the cryogenic barrier in the absence of conductive leads or joints.*”² This is not at all surprising since an express objective of Gamble is to avoid draw backs associated with conventional structures having power supply leads that extend through the cryogenic chamber, and therefore transfer heat into cryogenic chamber.³ These express teachings would have led those skilled in the art *directly away* from the “*common vacuum chamber*” feature of the claimed invention.

Furthermore, Applicants respectfully submit that the secondary references do not make up for the deficiencies of Gamble noted above. For example, and with reference to Fig. 3 of Dustmann, the flux pump (inclusive of the primary winding 32 and the secondary windings 31 and 33 and the switches 34-36) is provided in an aluminum housing 17, while the magnetic coil 11 is provided in a separate aluminum cylinder 16.

MOSFETs Connected in Parallel

Turning to the next point, the Examiner’s reliance upon the secondary reference to van de Klundert is also misplaced. Specifically, and with reference to Fig. 3 of van de Klundert, the device includes a transformer 1 having a secondary winding 1a coupled to a switching means 2,

¹ Gamble, column 4, lines 53-56.

² Gamble, column 4, lines 57-61.

³ Gamble, column 4, lines 11-25.

and a secondary winding 1b coupled to a switching means 3. The switching means 2 includes a commutating part 2a connected in *series* to a blocking part 2b. The switching means 3 is similar in this regard. Certainly then, van de Klundert. does not teach or suggest that each controllable switch includes a plurality of switching elements connected in parallel to one another:

The Examiner reasons that the commutating parts 2a and 3a of the respective switching means 2 and 3 are connected in parallel. However, the commutating parts 2a and 3a are constituent elements of the *separate and distinct switching means 2 and 3*. Furthermore, even if the commutating parts 2a and 3a were component parts of a single controllable switch, the Examiner's position would still be incorrect. This is because the commutating parts 2a and 3a are respectively connected to separate and distinct partial windings 1a and 1b of the transformer 1. In this regard, they are not connected in parallel, which means the division of a current path at a nodal point (node) into two paths (braches) and the subsequent recombining of these braches to form a joint current path at a different nodal point. Two technical articles (inclusive of "Electric Circuit Analysis" by S.A. Boctor and "Handbook of Modern Electronics and Electrical Engineering" by Charles Belove), which provide a straightforward definition of the term "*connected in parallel*," are attached for the Examiner's convenience.

Summary

In summary, the primary reference to Gamble includes express teachings that would have led those skilled in the art *directly away* from the claimed invention. Furthermore, independent claim 1 recites features that are all together missing from the prior art relied upon by the Examiner. Accordingly, even if those skilled in the art were somehow motivated to combine the references in the manner suggested by the Examiner, the prior art would still not meet each and every feature of the invention defined by independent claim 1.

B. Independent Claim 29:

Independent claim 29 is somewhat similar to independent claim 1 to the extent that independent claim 29 recites (among other things) that each of the controllable switches in the secondary-side rectifier circuit includes "*a plurality of MOSFETs electrically connected in parallel to one another*". Accordingly, independent claim 29 is believed to be patentable for reasons similar to those noted above with respect to independent claim 1.

CONCLUSION

For at least the above reasons, Applicants respectfully request reconsideration and allowance of each of claims 1, 4, 6-19, 23-29, 32 and 34-41.

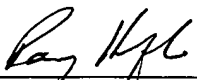
If any matters need to be resolved in the present application, the Examiner is respectfully requested to contact the undersigned at the telephone number listed below.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 08-0750 for any additional fees required under 37 C.F.R. § 1.16 or under 37 C.F.R. § 1.17; particularly, extension of time fees.

Respectfully submitted,

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